PRESSING COVER FOR A PRESS FOR DEWATERING WEB-SHAPED MATERIAL

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PRESSING COVER FOR A PRESS FOR DEWATERING WEB-SHAPED MATERIAL

Description of **GB2208879**

U 5 Pressing cover for a press for dewatering web-shaped material The

present invention relates to an elastically deformable pressing cover of a press for dewatering webshaped material, in particular of a dewatering press for papermaking machines or the like, the pressing cover having ridges on its outside between which there remain grooves which are open to the outside.

a pressing zone together ternatively surrounded by manner of a sandwich. The pressing Pressing covers and dewatering presses of this kind are known and are used, for example in the press part of papermaking machines, for the purpose of pressing water out of the still wet paper web and conducting it away. In this arrangement, the paper web is passed through ng felt or aLfelts in the can be formed of the pres with a dewateri two dewatering zone by two rotatable press rolls, at least one S rolls having an elastically deformable pressing cover pro vided with grooves. However, the pressing zone can also be formed by a single rotatable press roll and a pressure shoe which presses a revolving pressing cover against the press roll (with the formation of an extended pressing zone the direction of running). In either case water is zone and f e 1 t. P a r t the f e 1 t i n squeezed out of the paper web in the pressing released directly to at least one dewatering of the water here passes through the pores of into the abovementioned grooves in the pressing cover.

Grooves of this kind are provided in particular at relatively high paper web running speeds, i.e. at relaGrooved press rolls are worked into a metallic In the case f th e rolls, the cross- tivety high production speeds.

known, the grooves of which are roll cover. 0 e sectional shape of the grooves remains unchanged in the pressing zone. Here, however, the specific compression in the pressing zone is relatively high. For this reason there is the risk that the paper web will be crushed. In is used, the contrast, when an elastic pressing cover specific compression remains of an acceptable magnitude (even at a relatively high linear force). However, in sphericaLLy deformed in the pressing zone and the grooves are at the same time narrowed. This resuLts inter aLia in the disadvantage that the water- space - capacity of the grooves is reduced and the fLow-off of water through the grooves is hindered.

The present invention is concerned excLusiveLy with the eLastic pressing cover. A pressing cover of this kind can be appLied either as a fixed covering on a rotatabLe roLL eLement (cf. US Patent 4,353,296 and German Patent 2,814, 682). Or it is designed as a fLexibLe beLt or as a tube, the beLt or the tube being pressed against a mating roLL by means of a pressure shoe or by means of a rotating roLL eLement (cf. German OffenLegungsschrift 3,501,635 = US Patent 4,625,376; US Patent 4,552,620; US Patent 4,238, 287).

In the case of known eLastic pressing covers, measures have aLready been proposed with the aim of avoiding the narrowing of the grooves in the pressing zone.

Fig. 2a of US Patent 4,353,296 iLLustrates how the author of this pubLication conceives of the deformation of the ridges. It is proposed that these deformations be avoided or at Least reduced by using materiaLs having anisotropic properties. Thus the moduLus of eLasticity measured trans- verse to the direction of running is said to be greater than the moduLus of eLasticity measured in the direction of running. However, it is cloubtfuL whether this proposaL Leads to this goaL and whether it can be impLemented with a reasonabLe input of manufacturing expenditure.

German Patent 2,814,682 describes a press roLL having an eLastic cover, in which the grooves are widened at their base. However, the ridges are thereby weakened considerabLy at their "foot". For this reason there is the risk that the ridges wiLL bend over under Load and that the clewatering feLt wiLL thereby be damaged and/or the compression of the paper web wiLL no Longer take pLace with sufficient uniformity over its width.

A further attempt to soLve the probLem mentioned is described in WO 87/02080 with reference to an

eLastic pressing beLt for a pressure-shoe press. According to Fig. 2, the pressing beLt comprises an eLastomeric Layer of materiaL with a reinforcing fabric embedded in it.

Fig. 3 shows how - according to the conception of the author of this pubLication - the ridges are deformed in the pressing zone and the grooves are narrowed. To avoid this, it is proposed that the two sides of the eLasto meric Layer of materiaL be formed of different materiaLs.

In other words: the reinforcing fabric is to be coated with different types of pLastic on each of its two sides.

The resuLt is aLLegedLy that that side of the pressing beLt which sLicles over the pressure shoe is Less hard than the other side into which the grooves have been worked. However, a production process of this kind is very expensive because the coating of the reinforcing fabric must take pLace in two separate operations and the pressing beLt must be turned over in the interim. Further more there is the danger that the two different eLasto meric Layers wiLL come apart with time.

As wiLL be expLained beLow in cletaiL, an attempt has aLready been made to increase the water-hoLding capacity of the grooves in the pressing zone despite the deformation of the ridges - by making the grooves wider. However, the resuLt of this was that the grooves couLd be seen in the finished paper; i.e. the so-caLLed groove marking was produced in unclesirabLe fashion in the paper (cf. US Patent 4,353,296 coLumn 1, Lines 32-37).

The object on which the invention is based is therefore to design an eLasticaLLy cleformabLe pressing cover provided on its outside with grooves in a manner such that the grooves have a high water-hoLding capacity in the pressing zone and that the groove marking is.never theLess avoided in the finished paper. The pressing cover shouLd furthermore be producibLe with the minimum effort possibLe.

This object is achieved by reason of the fact that the top Land of the ridges, viewed in cross-section, is of concave design.

The foLLowing is thereby achieved: when the 1 1 - 4 elastic pressing cover according to the invention together with the likewise elastic dewatering felt (and together with the paper web) is subjected to the pressing pressure, the ridges are deformed such that their top lands - as seen in a cross-section - become flat. This means that the felt is (Largely or completely) uniformly compressed over the entire width of each ridge. By virtue of the invention it is thereby possible to make the grooves somewhat wider than hitherto (in order to achieve a high water-holding capacity in spite of the deformation) and nevertheless avoid the risk of the groove marking in the finished paper. This is because the more uniform compression of the felt results in a considerably more uniform compression and dewatering of the paper web across its width.

PRESSING COVER FOR A PRESS FOR DEWATERING WEB-SHAPED MATERIAL

Claims of **GB2208879**

Preferred dimensions of the grooves and ridges are given in Claims 3 and

4.

The pressing cover according to the invention can be designed (as are the known pressing covers mentioned at the beginning) as a fixed roll covering or as a tube or belt which runs round loosely. In the latter case, the pressing cover according to the invention has the advantage - as compared with WO 87102080 - that it is possible to dispense with different materials and degrees of hardness on the two sides (outside and inside) of the elastomeric layer of material. In other words: the invention makes it possible to use a single material for both sides (Claim 5). In the production of a pressing cover of this kind it is possible and preferable to use 30 the method described in Patent Application P 37 15 153.3. The invention is explained below in greater detail with reference to the drawing. This shows in Fig. 1 a press for dewatering paper webs having a pressing cover guided over a pressure shoe; 35 Fig. 2 a cross-section, parallel to the axis, at the outside of a pressing cover having dewatering grooves in accordance with the state of the art; Fig. 3 the cross-section according to Fig. 2 under Load from the pressing pressure; k Fig. 4 a cross-section in accordance with Fig. 2 having widened dewatering grooves as compared with the Latter representation, Likewise in accordance with the state of the art; Fig. 5 the cross-section according to Fig. 4 under Load from the pressing pressure; Fig. 6 a cross-section, the_outside of a pressing cover according to the invention; Fig. 7 a cross-section according to Fig. 6 under Load from the pressing pressure; Fig. 8 a section through a pressing cover of the type according to the invention, said section extending across the width of a papermaking machine; Fig. 9 a partial section according to Fig. 6 but with arrow heads.

In Fig. 1, a press 1 for dewatering a moving paper web 2 is illustrated diagrammatically - without a frame. This press 1 essentiaLLy comprises a top roll 3 and a bottom roLL 4, which for its part has a fixed core 5 in which a pressure shoe 6 which is pressed hydraulic ally against the top roLL 3 is guided. The fixed core 5 and the hydraulically mounted pressure shoe 6 of the bottom roll 4 are surrounded by an endless, tubular eLastic pressing cover 7 which is composed of an eLastomeric material having embedded reinforcing threads.

With its smooth inner surface, this pressing cover 7 slides over the pressure shoe 6 which, together with the top roLL 3, forms an extended pressing zone 8 (Long-nip press). The concave outside of the pressure shoe 6 is matched to the diameter of the top roLL 3.

To reduce the friction between the pressure shoe 6 and the pressing cover 7 a device (not shown) for wetting the inner side of the pressing cover 7 with Lubri- cant is provided.

the paper web 2 is fed in between two dewatering felts 9, 10 in the said pressing zone 8 (arrow d). By reason of the friction between the Lower dewatering felt 10 and the pressing cover 7 the Latter is moved over the parallel to the axis, at having ridges designed 1 1 - 6 pressure shoe 6 (arrow p). In the pressing zone 8, the outside of the pressing cover 7, which according to Figures 2 to 9 is provided with grooves, takes up water which has been removed from the paper web 2 from the lower dewatering felt 10. The water is temporarily stored in the grooves and is removed from these again outside the pressing zone 8.

In this arrangement, these grooves are provided across the entire width of the press 1 in equidistant di-ametral planes of the pressing cover 7; the grooves can also extend across the entire width of the pressing cover 7 in the form of a helical line.

The cross-section of the grooves is in general rectangular and the dimensions of this rectangle are such that the ratio between the depth of the grooves and the width of the grooves is preferably in the region between 4: 1 and 5: 1.

Fig. 2 shows a detail of a cross-section, parallel to the axis, through the outside of a conventional pressing cover 7, in the condition without loading by the pressing pressure. This outside consists of a uniform

sequence of ridges 11 and grooves 12. The top lands of the ridges 11 form the cylindrical shape of the pressing cover 7; i.e. the top lands are flat as seen in cross-section. In the pressing zone (8, Fig. 1), the grooves 12 form a storage volume for part of the water which is pressed out of the paper web and passes into the grooves via the dewatering felt 10.

Fig. 3 shows the detail of Fig. 2 with the de- watering felt 10 which, in the pressing zone 8, rests against the outside of the pressing cover 7, i.e. against the ridges 11. The pressing cover 7 and the felt 10 are now subjected to the pressing pressure; in the process the elastic material of the pressing cover 7 is deformed in a manner such that it is principally the top lands of the ridges 11 which are spherically deformed and the grooves 12 simultaneously become narrower at their open end. The to spherical deformation" of the top lands of the ridges 11 means that these top lands, as viewed in cross- section, k, t 5 take on a convex shape.

The dewatering felt 10, which is likewise compressed, lies matingly on this convexly shaped top land; i.e. the felt is more highly compressed in the middle of each ridge than at the two edges. As mentioned, the grooves 12 are narrower towards the outside and take on approximately the crosssectional shape of an equilateral trapezium. This narrowing of the grooves 12 _is generally so great that the grooves can only take up a relatively small quantity of water.

A likewise conventional modification of the press- ing cover 7 as compared to Figures 2 and 3 is shown in Figures 4 and 5. Here the grooves 121 are designed wider than in Fig. 2. The narrowing of the grooves (as a consequence of the pressing pressure) relative to the groove width is thus less in Fig. 5 than in Fig. 3, with the result that the water-space capacity of the grooves 121 and of the flow off cross-section for the water are adequate. (A further widening of the grooves 12, while retaining the same groove spacing, is not useful in view of the decreasing resistance of the ridges to tilting which this causes.) In accordance with the widening of the grooves 12', the ridges 11' are narrower than the ridges 11.

Accordi ciple deformed 11 in Fig. 3. One disadvantage of the great the grooves is that the dewatering felt 10 n against the convexly shaped top lands but al more than in Fig. 3 - is partially pressed grooves 121. In addition, it can be seen t felt 10 is more highly compressed - even mo ng to Fig. 5, the ridges 11' in exactly the same manner as are in printhe ridges r width of t only 1 ies o - much nto the at the elastic e than in Fig. 3 - in the middle of the ridge than at the edges. It has been realized that this is the reason for the undesired groove marking, already mentioned above, in the finished paper. It can also be seen that the previous conceptions (Fig. 2a of US Patent 4,353,296 and Fig. 3 of WO 87/02080) of the nature of the deformation of the ridges are apparently incorrect since they do not take into account that the felt, which, in the pressing zone, is pressed against the top Lands of the ridges is Likewise eLasticaLLy deformabLe. At any event, in Fig. 5 the uniformity of the compression (and thus of the dewatering of the paper web) over the width of the machine is reduced so much that the quaLity of the paper no Longer meets the requirements made.

Fig. 6 Mustrates a detaiL of a pressing cover 7 in accordance with the present invention, said pressing cover having approximateLy the same groove width and the same groove spacing as in Figures 4 and 5. The ridges 1111 are now of concave design at their top Lands 13, as seen in cross-section.

When - as iLLustrated in Fig. 7 - the dewatering feLt 10 (together with the paper web) and the pressing cover 7 now run through the pressing zone 8 (Fig. 1), the more eLevated edge regions of the concave top Lands 13 of the ridges 1111 are pressed fLat; the sides of the grooves 1211 are at the same time pressed inwards, so that these grooves 12 11 once more have essentiaLLy the cross-sec- tionaL shape of an equiLateraL trapezium.

From the iLLustration according to Fig. 7 it can be seen that the boundary between the dewatering feLt 10 and the ridges 11" now stretches in a straight Line across the width of the pressing cover 7. Of course, the dewatering feLt 10 is partiaLLy pressed into the grooves 1211 even in Fig. 7. In comparison with the representations according to Figures 3, 5 and 7 however, it can easiLy be seen that the deformations of the dewatering feLt 10, i.e. the maximum deviations between the geometric points represented by the middLe of the ridge and the middLe of the groove compare x in Fig. 3, y in Fig. 5 and z in Fig. 7 - are the Least in the exempLary embodiments of the invention in Fig. 7. This aLso means however that substantiaLLy uniform compression of the paper web across 35 its width and at the same time a reLativeLy Large waterhoLding capacity of the grooves has successfuLLy been achieved. FinaLLy, the dewatering feLt 10 may aLso, be expected to suffer Less wear.

It is possibLe to conceive of the specific concave geometry of the top lands 13 of the ridges 1111 as an arcuate, V-shaped or even polygon-like recess or notch. The most advantageous shape, as well as the most advantageous dimensions depend on the particular pressing cover material used and from the particular type of dewatering f e 1 t.

on all ing (i e ferentia cover ma Fig. 8 shows a detail of a tubular pressing cover 7 h.aving a plurality of ridges 1111 and grooves 1211 in uniform sequence. These ridges 11" and grooves 1211 run in the circumferential direction or helically across the entire pressing cover. The top Lands 13 of the ridges 11" are again of concave design, as seen in cross-section.

In the region between the outside (which is provided with the grooves 12') and the smooth inside which slides over the pressure shoe (6 in Fig. 1), the pressing cover 7 shown in Fig. 8 has high-strength reinforcing threads (Longitudinal threads 14 and circumferentiaL threads 15), whose elasticity is Less than that of the eLastomeric pressing cover material 17. According to Patent Application P 3,715,153, the eLastomeric Layer 17 of material (at Least that part of this Layer 17 of material whi;ch surrounds the reinforcing threads 14, 15 ides) is preferably produced from a single castin a single casting operation), the circumthreads 14 being wound into the still Liquid eriaL 17 during the casting operation.

Preferred dimensions with respect to the grooves and the ridges will in addition be given below with reference to Fig. 9.

The spacing of the grooves with respect to one another (dimension a) is preferably 2.5.... 3.5 mm. The width of the grooves in the nonLoaded condition (dimension b) is then preferably 0.7.... 1.2 mm, in combination with a depth (dimension t) of preferably (0.8.... 35 1.0) times the groove spacing a.

The depth of the concave recesses (dimension m), which according to the invention are provided on the top Lands of the ridges, is preferably 0.02. ... 0.4 mm, and this recess depth m should be matched to the material of the pressing cover and the pressing force in the pressing n i p.

In certain circumstances it is also conceivable for the reduction in the recess depth m which results over time during operation (due to wear at the edges of the recess) to be compensated by reducing the linear force in the pressing nip as the Length of time in operat ion increases, i.e. as the wear increases. It is thereby possible initially to select a relatively large recess depth m for a new press cover, i.e. in the region of 0.4 mm, as mentioned.

1 CLA 1 IVIS 1. An elastically deformable pressing cover of a press for dewatering web- shaped material, the pressing cover having ridges on Its outsidi and grooves which are open to the outside between the ridges, each ridge having a concave top land, as seen In cross-section. 2. Elastically deformable pressing cover of a press for dewatering web-shaped material, In particular of a dewatering press for papermaking machines or the like, the pressing cover having ridges on Its outside which fie in preferably equidistant diametral planes In the manner of circular rings or run round in the form of a helical line, grooves (12---) which are open to the outside remaining between the ridges (11"), characterized In that each ridge (11---) has a concave top land (13), as seen in cross-section. 3. Pressing cover according to Claim 2, characterized In that the width (b) of the grooves is about 0.7.... 1.2 mm.

4. Pressing cover according to Claim 2 or 3, characterized In that - as seen In cross-section - the top land (13) is deeper by the dimension m = 0.02....

0.4 mm In the middle than at the two edges.

5. Pressing cover according to one of Claims 2 to 4, characterized In that it comprises an elastomeric layer (17) of material and reinforcing threads (14,15) embedded therein, and that the entire elastomeric layer (17) of material, Including the outer zone which Is provided with the grooves (12"), Is produced from a uniform material.

6. Elastically deformable pressing cover substantially as herein described with reference to, and as shown In any of Figures 6 to 9 of the accompanying drawings.

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Fig. 1

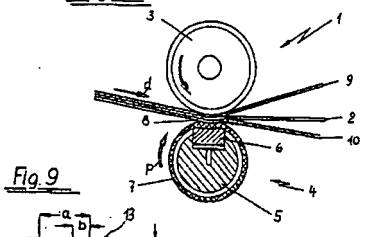

Fig. 9

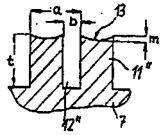

Fig. 8

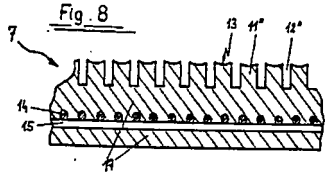

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Fig. 2

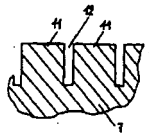

Fig. 3

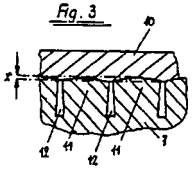

Fig. 4

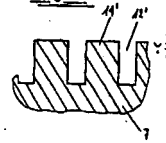

Fig. 5

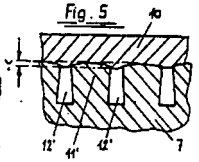

Fig. 6

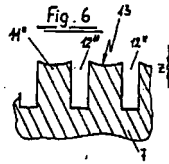

Fig. 7